

## CLAIMS

What is claimed is:

1. A method for cylindrical processing of an optical medium, comprising the steps of:
  - a. rotating an optical medium about a longitudinal relative rotation axis thereof relative to a processing tool; and
  - b. spatially selectively applying the processing tool to a portion of a surface of an optical medium, in operative cooperation with relative rotation of the optical medium and the processing tool, thereby producing spatially selective alterations in the optical medium.
2. The cylindrical processing method of Claim 1, wherein the optical medium comprises a silica-based optical fiber including a core and a cladding layer.
3. The cylindrical processing method of Claim 2, wherein the alterations include at least one ring.
4. The cylindrical processing method of Claim 2, where the alteration includes a spatially selective surface mask.
5. The cylindrical processing method of Claim 2, wherein the optical medium includes a hermetic carbon outer coating and the alteration includes the step of spatially selectively removing the hermetic carbon coating.
6. The cylindrical processing method of Claim 4, wherein the processing-tool-applying step includes the step of forming a surface mask by spatially selective deposition of mask material on portions of the optical medium.
7. The cylindrical processing method of Claim 1, wherein the spatially selective alterations includes spatially selective deposition of optical material on the optical medium.
8. The cylindrical processing method of Claim 1, wherein the spatially selective alterations includes spatially selective removal of matter from the optical medium.
9. The cylindrical processing method of Claim 1, wherein the spatially selective alterations includes spatially selective refractive index changes in the optical medium.
10. The cylindrical processing method of Claim 1, wherein the processing-tool-applying step include the steps of:

- 1       a.   controlling relative longitudinal motion of the optical medium and of the processing
- 2       tool; and
- 3       b.   controlling relative radial motion of the optical medium and of the processing tool.
- 4   11. The cylindrical processing method of Claim 1, wherein the processing-tool-applying step
- 5       includes spatially selectively delivering a processing beam to the optical medium with a
- 6       beam delivery assembly.
- 7   12. A method for fabricating a fiber-ring resonator comprising the steps of:
- 8       a.   rotating a resonator optical fiber about a longitudinal relative rotation axis thereof
- 9       relative to a processing tool; and
- 10      b.   spatially selectively applying the processing tool to a portion of the optical resonator
- 11       fiber, in operative cooperation with the relative rotation of the resonator fiber to the
- 12       processing tool, thereby producing a resonator segment in the resonator fiber, the
- 13       resonator segment having a circumferential optical path length differing from the
- 14       circumferential optical path length of the resonator fiber adjacent to the resonator
- 15       segment.
- 16   13. The fabricating method of Claim 12, wherein the processing tool deposits material on the
- 17       resonator fiber.
- 18   14. The fabricating method of Claim 12, wherein the processing tool removes material from the
- 19       surface of the resonator fiber adjacent to the resonator segment.
- 20   15. The fabricating method of Claim 12, further including the step of providing an alignment
- 21       member on the outer circumference of the resonator segment of the resonator fiber.
- 22   16. The fabricating method of Claim 12, further including the step of altering the
- 23       circumferential optical path length of the resonator segment, thereby altering a resonant
- 24       frequency of a resonator optical mode supported by the resonator segment.
- 25   17. A method of fabricating an alignment member by cylindrical processing of an optical fiber,
- 26       comprising the steps of:
- 27       a.   rotating an optical fiber about a longitudinal relative rotation axis thereof relative to a
- 28       processing tool; and

- 1        b.    spatially selectively applying the processing tool to a portion of the optical fiber and the  
2            processing tool, thereby producing alterations of the optical fiber including at least one  
3            of a radially-projecting portion and a radially-recessed portion.

4    18. An apparatus for cylindrically processing an optical medium, comprising:

- 5        a.    a processing tool;  
6        b.    an optical medium rotator, the rotator being arranged for rotating an optical medium  
7            about a longitudinal relative rotation axis thereof relative to the processing tool; and  
8        c.    a tool positioner, the tool positioner being arranged so as to spatially selectively apply  
9            the processing tool in operative cooperation with the rotation of the optical medium  
10        relative to the processing tool.

11   19. The apparatus of Claim 18 wherein the optical medium rotator includes a rotary bearing and  
12        a rotary actuator, the rotary bearing and rotary actuator being arranged to rotate the optical  
13        medium relative to the processing tool.